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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,851	11/24/2003	Fumikatsu Uesawa	09792909-5787	5189

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EXAMINER

SMOOT, STEPHEN W

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 03/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

11A

Office Action Summary	Application No.		Applicant(s)	
	10/720,851		UESAWA, FUMIKATSU	
	Examiner		Art Unit	
	Stephen W. Smoot		2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 7, 8 and 10-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8, 10 and 12-15 is/are rejected.
- 7) ☒ Claim(s) 7 and 11 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 10/154,237.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office action is in response to applicant's amendment filed on 25 February 2005, which has been entered.

Allowable Subject Matter

1. The indicated allowability of claims 1-4, 8, 10, 12-15 are withdrawn in view of the newly discovered references to Figura et al. and to Juengling. Rejections based on the newly cited references follow.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-4, 8, 10, 12-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Figura et al. (US 5,750,441).

Referring to Figs. 1-4 and column 2, line 38 to column 3, line 43, Figura et al. disclose a method of forming a contact opening that includes the following features:

- A conformal insulation layer (24) is formed over a semiconductor substrate (16) with gate stacks (i.e. steps);
- A planar first mask layer of photoresist (26) (i.e. an organic insulator with a dielectric constant less than that of silicon dioxide – also see column 1, lines 45-47) is formed over the insulation layer (24);
- A second mask layer (28) is formed over the first mask layer of photoresist (26);
- A third mask layer of photoresist (30) is formed over the second mask layer (28);
- The third mask layer of photoresist (30) is patterned by etching and stops on the second mask layer as shown in Fig. 1;
- The pattern is then transferred to the second mask layer (28) by etching as shown in Fig. 2;
- The first mask layer of photoresist (26) is then patterned by etching to form a tapered hole down to the insulation layer (24) as shown in Fig. 3;
- The tapered hole can have a top width (36) that is five times wider than the bottom width (34) thereby reducing a conventional 0.5 μm line width resolution to 0.1 μm (see column 1, lines 32-36 and column 3, lines 32-36);

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- The bottom width pattern (34) is then transferred to the insulation layer (24) by etching (also see column 5, lines 8-10, 20-22, 28-30) to form vertical openings to the substrate (16) as shown in Fig. 4; and
- The three mask layers (26, 28, 30) are subsequently removed.

These are all of the limitations set forth in claims 1-4, 8, 10, 12-15 of the applicant's invention.

4. Claims 1-2, 4, 8, 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Juengling (US 6,548,347 B2).

Referring to Figs. 8-11, 15 and column 5, line 9 to column 6, line 57, Juengling discloses a method of forming a minimal spacing between word lines that includes the following features:

- Layers of oxide (54), polysilicon (56), and metal silicide (58) are sequentially formed over a semiconductor substrate (51, 52);
- An insulating layer (59) that can be a high temperature polymer is formed over the metal silicide layer (58);
- A photoresist layer (60) is formed over the insulating layer (59);
- The photoresist layer (60) is patterned by exposure and development to define an opening (62) with width W as shown in Fig. 9;
- The insulating layer (59) is then dry etched to form a tapered opening (63) down to the metal silicide layer (58) as shown in Fig. 10;

- The tapered opening (63) can have an upper width (W) that ranges from 1000 to 3000 angstroms and a lower width (CD) ranging from 100 to 400 angstroms that exceeds current lithography technologies (also see column 2, lines 8-13);
- The lower width (CD) is then transferred to the layers of oxide (54), polysilicon (56), and metal silicide (58) by etching to form a vertical opening (64) as shown in Fig. 11; and
- The insulating layer (59) is subsequently removed as shown in Fig. 15 (also see column 7, lines 11-13).

These are all of the limitations set forth in claims 1-2, 4, 8, 10 of the applicant's invention.

Allowable Subject Matter

5. Claims 7, 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter:

- Claim 7 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a method of manufacturing a semiconductor apparatus that includes forming a tapered

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aperture pattern in a first mask material and using the first mask material to vertically etch an aperture into a film with a dimension that exceeds the capabilities of lithography techniques, wherein forming the tapered aperture pattern includes setting a temperature of a substrate to between minus 50 and zero degrees Centigrade; and

- Claim 11 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a method of manufacturing a semiconductor apparatus that includes forming a tapered aperture pattern in a first mask material and using the first mask material to vertically etch an aperture into a film with a dimension that exceeds the capabilities of lithography techniques, wherein the first mask material is made of an organic insulation film and has a heatproof temperature of about 350 degrees Centigrade.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS

Stephen W. Smoot
Patent Examiner
Art Unit 2813